PB-242 307

IMPLEMENTATION PLAN REVIEW FOR WYOMING AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

TRW/Environmental Services

Prepared for:

Environmental Protection Agency

March 1975

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE

169052

EPA-450/3-75-022

MARCH 1975

PB242307

IMPLEMENTATION PLAN REVIEW FOR WYOMING AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-450/3-75-022	2. PB 242 307
4. TITLE AND SUBTITLE: IMPLEMENTATION PLAN REVIEW FOR WYOMING AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT.	5. REPORT DATE: March 1975
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C., Regional Office VIII, Denver, Colorado, and TRW, Inc., Redondo Beach, Calif. 90278	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO. 68-02-1385
12. SPONSORING AGENCY NAME AND ADDRESS: U. S. Environmental Protection Agency, Office of Air and Waste Management, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711	13. TYPE OF REPORT AND PERIOD COVERED
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution State Implementation Plans		

PRICES SUBJECT TO CHANGE

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Release Unlimited	Unclassified	033
	20. SECURITY CLASS (This page) Unclassified	22. PRICE $3.75 - 2.25

EPA Form 2220-1 (9-73)

EPA-450/3-75-022

IMPLEMENTATION PLAN REVIEW
FOR
WYOMING
REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

U. S. Environmental Protection Agency, Region VIII
1860 Lincoln Tower Building
Denver, Colorado 80203

Environmental Services of TRW, Inc.
(Contract 68-02-1385)

U. S. Environmental Protection Agency
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

March 1975

TABLE OF CONTENTS

		Page
1.0	EXECUTIVE SUMMARY	1
2.0	STATE IMPLEMENTATION PLAN REVIEW	5
2.1	Summary	5
2.2	Air Quality Setting - State of Wyoming	9
2.2.1	Wyoming AQCR's	9
2.2.2	Wyoming Air Quality Standards	9
2.2.3	Air Quality Monitoring and 1973 TSP and SO_2 Levels	9
2.3	The Wyoming State Implementation Plan and Current Emission Regulations	11
2.3.1	Particulates	11
2.3.2	SO_2	11
2.3.3	NO_x	11
2.4	Wyoming Air Quality Maintenance Areas	12
3.0	AQCR ASSESSMENTS BASED ON SIP REVIEW AND CURRENT AIR QUALITY	13
3.1	Regional SO_2 and Particulate Emissions	13
3.2	Candidacy Assessment for Regulation Relaxation	13
3.2.1	Particulates	13
3.2.2	SO_2	14
3.3	Power Plant Examination	14
3.4	Industrial and Area Sources	15
3.5	Wyoming NO_x Regulations	15
3.6	Wyoming Energy Supply	15
BIBLIOGRAPHY		16
APPENDIX A		A-1
APPENDIX B		B-1
APPENDIX C		C-1
APPENDIX C		D-1
APPENDIX E		E-1

1.0 EXECUTIVE SUMMARY

The enclosed report is the U.S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The States have also been asked to discourage large scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and SO_2 emissions which occur in fuel switching, and other potential air pollution problems such as sulfates.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have or are currently in the process of revising SO_2 regulations. These States are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are 1) The use of the example region approach in developing State-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS (reflecting a state's desire to attain or maintain air quality levels below NAAQS) and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned state-wide where the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

Part of each State's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendices C, D, and E.

FINDINGS

- The Wyoming Implementation Plan has been reviewed for frequent causes of overly restrictive emission regulations. The Wyoming fuel burning particulate regulation does not appear overly restrictive in the context of Section IV of ESECA. The recently adopted Wyoming SO_2 emission regulation may be more restrictive than necessary to maintain NAAQS for SO_2.

- Ambient levels for TSP were reported to exceed NAAQS in all Wyoming AQCR's during 1973. The Wyoming SIP demonstrated attainment of NAAQS for TSP only in the Cheyenne AQCR, although SIP particulate regulations were to apply statewide. The Casper and Wyoming AQCR's have counties designated as maintenance areas for TSP. Although fugitive dust no doubt contributes to TSP levels in Wyoming, increases in man made emissions will aggravate the situation. There is little indication that Wyoming particulate emission regulations are overly restrictive.

- Although Wyoming did not propose fuel burning SO_2 emission regulations in the original SIP, the state has recently adopted such regulations. Limited SO_2 monitoring data show SO_2 levels to be well below NAAQS throughout Wyoming. Wyoming established ambient SO_2 standards more stringent than the Federal standard. Sweetwater County (Wyoming AQCR) was recently designated as a maintenance area for SO_2. In the absence of modeling results, the recently adopted SO_2 regulations do appear more stringent than necessary to maintain the Federal ambient air quality standards.

- Large power plants in Wyoming currently use only coal as fuel. Limited data suggests little coal use by the industrial sector. The feasibility of fuel switching for smaller sources is unknown.

2.0 STATE IMPLEMENTATION PLAN REVIEW

2.1 SUMMARY

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the SIP have emission limiting regulations for control of existing (1) power plants, (2) industrial sources, and (3) area sources?
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State initiated action to modify combustion sources emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on reported (1973) Air Quality Data, does air quality meet NAAQS?
- Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?
- Are the total emissions from stationary fuel combustion sources lower than those of other sources?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?
- Must emission regulations be revised to accomplish significant fuel switching?
- Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?
- Is there a significant Clean Fuels Saving potential in the region?

The initial part of the SIP Review Report, Section 2, Appendix A, was organized to provide the background and current situation information for the State Implementation Plan. Section 3 and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with a regional analysis, a characterization of the state fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendices C, D, and E.

Based on overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulations revisions. These ratings, which are shown in the Summary Table on Page 8 were determined by assessing the following criteria:

Good	Poor	Marginal
1) Adequate number of air monitoring sites	1) Violation of NAAQS	1) No air quality data or insufficient number of monitoring sites
2) No NAAQS violations	2) Attainment date for NAAQS later than 1975	2) Inconsistent "indicators"
3) Attainment date of 1975 for NAAQS in the SIP	3) Proposed AQMA	
4) No proposed AQMAs	4) Modeling results show no potential for regulation revision	
5) Modeling results show a potential for regulation revision		

For an AQCR to be rated as a good candidate, all of the criteria listed under "Good" would have to be satisfied. The overriding factor in rating an AQCR as a poor candidate is a violation of either the primary or secondary National Ambient Air Quality Standards during 1973. However, if any of the other conditions listed under "Poor" exists, the AQCR would still receive

that rating. The predominant reason for a marginal rating is a lack of sufficient air quality data. Marginal ratings are also given when there are varying or inconsistent "indicators."

The following table summarizes the State Implementation Plan Review. The remaining portion of the report supports this summary with explanations.

Wyoming Implementation Plan Review
Summary Table

"INDICATORS"	STATE		AQCR 241 (CASPER)		AQCR 242 (CHEYENNE)		AQCR 243 (WYOMING)	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	NO	YES						
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources	 YES YES YES	 YES YES NO						
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	NO[1]	NO						
• Has the State initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	NO	NO						
• Are there proposed Air Quality Maintenance Areas?			YES	NO	NO	NO	YES	YES
• Are there indications of a sufficient number of monitoring sites within a region?			YES	NO	YES	NO	YES	NO
• Is there an expected 1975 attainment date for NAAQS?			NO	YES	YES	YES	NO	YES
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?			NO	YES	NO	YES	NO	YES
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?			NO	YES	NO	YES	NO	YES
• Are the total emissions from stationary fuel combustion sources lower than those of other sources?			NO	NO	YES	YES	YES	NO
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	NO MODELING DATA AVAILABLE FOR WYOMING SOURCES							
• Must emission regulations be revised to accomplish significant fuel switching?			NO[2]	NO	NO[2]	NO	NO[2]	NO
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?			POOR	GOOD	POOR	GOOD	POOR	GOOD
• Is there a significant Clean Fuels Saving potential in the region?			NO[2]	NO[3]	NO[2]	NO[3]	NO[2]	NO[3]

[1] AQCR 242 (Cheyenne) was used to demonstrate attainment of NAAQS for particulates.

[2] All large Wyoming power plants use coal at present, some industrial fuel switching could occur within existing regulations.

[3] Regulation relaxation would allow use of higher sulfur content coal, however, savings would not be substantial due to present lack of major users in the state.

2.2 AIR QUALITY SETTING - STATE OF WYOMING

2.2.1 Wyoming AQCR's

The State of Wyoming was divided into three Air Quality Control Regions - AQCR's. They are as follows:

241 - Casper Intrastate Air Quality Control Region
242 - Cheyenne Intrastate Air Quality Control Region
243 - Wyoming Intrastate Air Quality Control Region

Figure 2.1 shows the boundaries of Wyoming AQCR's.

2.2.2 Wyoming Air Quality Standards

A summary of the federal and Wyoming Ambient Air Quality Standards for the pollutants under study is presented in Table A-3. The Wyoming standards for particulates and NO_2 are identical to the federal secondary standards. The Wyoming SO_2 air quality standards for both the annual average and 24 hour maximum are more stringent than the Federal Air Quality Standards.

2.2.3 Air Quality Monitoring and 1973 TSP and SO_2 Levels

Thirteen TSP monitoring stations reported data to the SAROAD bank for 1973. Table A-4 shows violations of the annual secondary TSP standard in all Wyoming AQCR's. In addition, violations of the secondary 24 hour standard were reported in each AQCR. Only one Wyoming monitoring station (AQCR 243-Wyoming) reported violations of the primary TSP standard. Fugitive dust may be a factor in Wyoming TSP levels, particularly short-term violations of NAAQS.

SO_2 levels appear to be well below NAAQS in 1973, although SO_2 monitors are few and widely spaced (5 monitoring stations reported data in 1973). The low SO_2 levels in Table A-5 may partially reflect lack of source orientation. Additional SO_2 and TSP monitors have been recently added to Wyoming's network, which now includes 24 total TSP monitors and eight total SO_2 monitors.

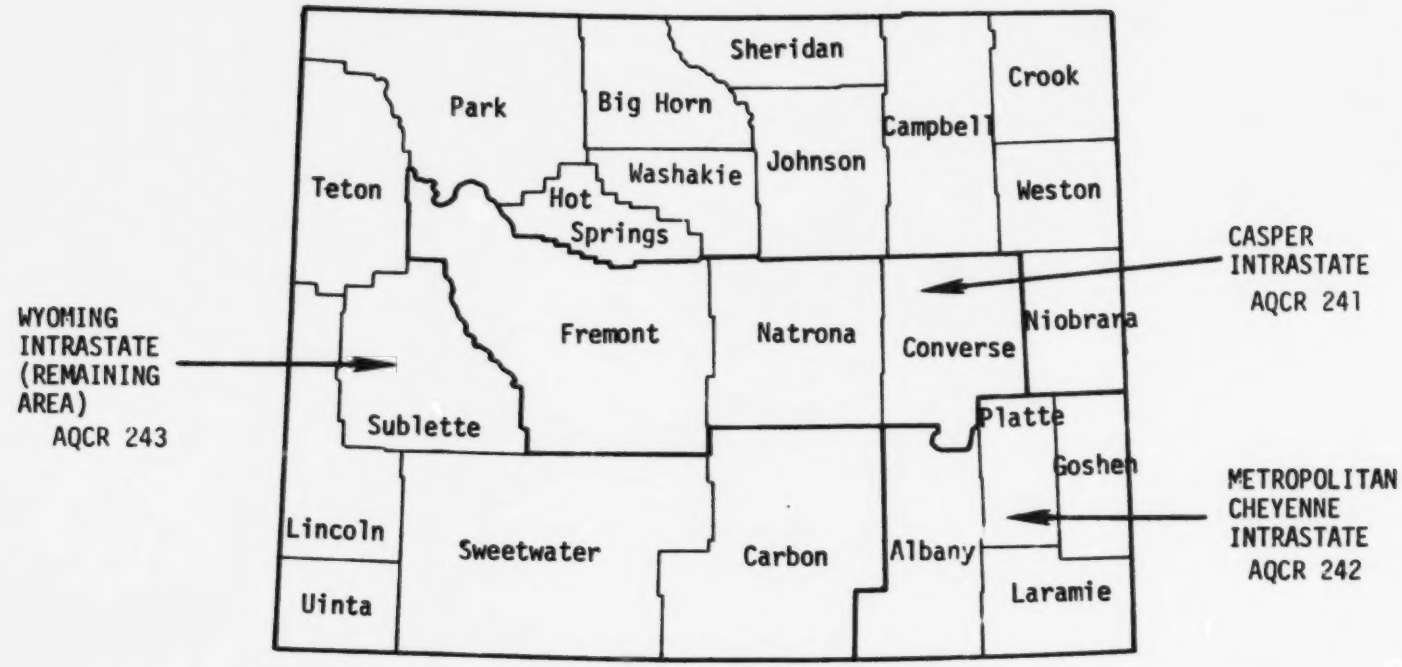

Figure 2-1. Air Quality Control Regions in Wyoming

2.3 THE WYOMING STATE IMPLEMENTATION PLAN AND CURRENT EMISSION REGULATIONS

Table A-1 lists the original priority classifications for Wyoming AQCR's. All AQCR's were classified priority III for SO_2 and NO_2. Casper (241) and Cheyenne (242) were classified priority II for suspended particulates, while Wyoming (243) was classified priority III.

2.3.1 Particulates

The Wyoming SIP demonstrated attainment of NAAQS for particulates in AQCR 242 (Cheyenne). Application of particulate regulations to one major point source (a cement plant) alone in the Cheyenne AQCR was calculated to achieve a 2/3 reduction of inventoried emissions in that region. Although a 93% reduction in emissions in AQCR 242 was necessary for NAAQS attainment based upon rollback proportional to air quality levels, the source oriented nature of the high ambient TSP measurements and the 98% expected control of the major source was determined to be adequate for demonstrating attainment of NAAQS. The Wyoming plan proposed the application of particulate control regulations statewide so that AQCR's 241 (Casper) and 243 (Wyoming) would also maintain air quality below NAAQS for TSP. Particulate control regulations applicable in Wyoming for fuel combustion sources are summarized in Table A-10.

2.3.2 Sulfur Dioxide

All AQCR's in Wyoming were classified priority III for SO_2. The Wyoming SIP proposed SO_2 emissions controls only for sulfuric acid plants. Recently, however, Wyoming has adopted SO_2 emission regulations for both existing coal burning sources and new coal and oil burning sources (Table A-10).

2.3.3 NO_x

Wyoming also adopted NO_x regulations for oil and gas fired equipment (Table A-10). Wyoming's three AQCR's were classified priority III for NO_2, so that these regulations were not required for demonstrating attainment of NAAQS. Wyoming NO_x regulations do not apply to coal users.

2.4 WYOMING AIR QUALITY MAINTENANCE AREAS

Wyoming has designated three Air Quality Maintenance Areas for TSP: 1) Converse County in AQCR 241 (Casper), 2) and 3) Campbell and Sweetwater Counties in AQCR 243 (Wyoming). (See Table A-1). Sweetwater County has been designated as an SO_2 maintenance area. It is anticipated that special requirements for these areas will be developed by the State and submitted to EPA as a modification to the State Implementation Plan.

3.0 AQCR ASSESSMENTS BASED ON SIP REVIEW AND CURRENT AIR QUALITY

The purpose of this section is to examine fuel switching in each of Wyoming's three AQCR's and the adequacy or over-restrictiveness of current regulations for attaining and/or maintaining ambient air quality standards. Table A-9 is an attempt to assign a regional particulate emission tolerance for Wyoming AQCR's. Appendix B uses this "tolerance," along with such factors as, the breadth and depth of air quality violations, AQMA designations, and percent of emissions resulting from fuel combustion to rate each AQCR as a "good," "marginal," or "poor" candidate for fuel switching potential and regulation relaxation.

Power plants and industrial sources, are investigated in Appendices C, & D, respectively for fuel use, emissions, and current regulations. Some calculations of emissions resulting from new Wyoming power plants are included. Appendix E summarizes fuel use by sectors and Wyoming fuel production.

3.1 REGIONAL SO_2 AND PARTICULATE EMISSIONS

Tables A-7 and A-8 present SO_2 and particulate emission summaries for Wyoming AQCR's. About 50% of inventoried particulate emissions come from fuel combustion sources on a statewide basis. The emissions are unequally distributed between source types, however, with fuel combustion accounting for 88% of the Casper AQCR emissions and only 11% of Cheyenne AQCR particulate emissions. Fuel combustion sources contribute two-thirds of total SO_2 emissions on a statewide basis.

Table A-9 presents an estimate of allowable particulate emissions for each AQCR based on 1973 air quality. Allowable SO_2 emissions are not calculated since low ambient SO_2 levels and scanty monitoring make any "roll up" estimate questionable.

3.2 CANDIDACY ASSESSMENT FOR REGULATION RELAXATION

3.2.1 Particulates

Table B-1 combines information in Appendix A into an evaluation of an AQCR's potential for relaxation of the Wyoming particulate regulations. Ambient TSP levels exceed NAAQS in all three Wyoming AQCR's. The Casper

(241) and Wyoming (243) AQCR's have counties designated as maintenance areas for TSP. Cheyenne (AQCR 242) has a low percentage of inventoried particulate emissions resulting from fuel combustion. Particulate regulation relaxation potential is rated as poor in all three of Wyoming's AQCR's.

3.2.2 SO_2

All Wyoming AQCR's show SO_2 levels to be well below NAAQS. One county in the Wyoming AQCR has been designated an AQMA for SO_2 and therefore, has to be rated as a poor candidate for regulation relaxation. The remaning AQCR's are rated as good candidates.

3.3 POWER PLANT EXAMINATION

Table C-1 lists fuel use and emissions for individual power plants in Wyoming. Only two of the State's AQCR's (Casper and Wyoming) contain power plants. The 1972 and 1973 fuel schedules indicate that the large power plants in Wyoming have been recently using coal for all of their fuel requirements. The data also indicate that Wyoming particulate regulations were not met in 1973 based upon NEDS emissions inventories. There appears to be little fuel switch potential for Wyoming power plants, and there is no indication that Wyoming particulate regulation applied to power plants will restrict emissions to levels much below the amount necessary to attain and maintain NAAQS.

All Wyoming AQCR's have been rated as good candidates for increased SO_2 emissions in Table B-2 based upon 1972 and 1973 air quality data. The recently adopted Wyoming SO_2 emission regulation would apparently not have been met if it had applied the 1972 and 1973 fuel schedules of the large Wyoming coal fired power plants (Johnson and Naughton). The limited SO_2 monitoring data in the SAROAD Bank suggest that the present SO_2 regulations on both existing and new sources may not be required for maintenance of NAAQS. Verification of "non-violation" of NAAQS would, of course, require a case by case examination and perhaps diffusion modeling.

3.4 INDUSTRIAL AND AREA SOURCES

Little coal is apparently used at present by industrial and area sources in Wyoming (Tables D-1 and E-1). However, NEDS SO_2 and particulate emission information available for this report is incomplete. It does appear that some increased industrial coal use could occur within existing particulate and SO_2 regulations. The physical limitations of existing facilities (boiler design, internal combustion sources, etc.) are probably the more limiting factor for fuel switching than the inability to meet emission regulations.

3.5 WYOMING NO_x REGULATIONS

NO_x regulations for existing sources in Wyoming apply to oil and gas users. Since large Wyoming power plants currently use coal, the NO_x regulations have little bearing on electric power generation. New power plants will be subject to New Source Performance Standards (NSPS) for NO_x, as shown in Table A-10.

3.6 WYOMING ENERGY SUPPLY

Wyoming has extensive crude oil and natural gas fields in the central and eastern portion of the State. In addition, Wyoming has sub-bitumunous coal deposits in the Powder River and Green River Basins. Wyoming is also a major uranium producer in the United States. Although Wyoming possesses oil shale deposits in the Washakie Basin, near term commercial exploitation of the shale resource is not expected. Table E-2 summarizes 1972 energy production and domestic consumption for Wyoming. Fuel availability would not appear to be a constraint for potential fuel substitution for Wyoming sources.

BIBLIOGRAPHY

(1) "1972 National Emissions Report," U.S. Environmental Protection Agency, EPA-450/2-74-012.

(2) "Projections of Economic Activity for Air Quality Control Regions," U.S. Department of Commerce, Bureau of Economic Analysis, Prepared for U.S. EPA, August 1973.

(3) "Monitoring and Air Quality Trends Report, 1972," U.S. EPA-450/1-73-004.

(4) "Steam-Electric Plant Factors/1072," 22nd Edition National Coal Association.

(5) "Federal Air Quality Control Regions," U.S. EPA, Pub. No. AP-102.

(6) "Assessment of the Impact of Air Quality Requirements on Coal in 1975, 1977 and 1980," U.S. Department of the Interior, Bureau of Mines, January 1974.

(7) "Fuel and Energy Data," U.S. Department of Interior Bureau of Mines, Government Printing Office, 1974, 0-550-211.

(8) "Compilation of Air Pollutant Emission Factors, 2nd Edition," U.S. EPA, Air Pollution Tech., Pub. AP-42, April 1973.

(9) SAROAD Data Bank, 1973 Information, U.S. EPA.

(10) Federal Power Commission, U.S. Power Plant Statistics Stored in EPA Data Bank, September 1974.

(11) Environmental Quality Council of Wyoming, "Air Quality Standards and Regulations" Sections 1-20. Effective April 9, 1973, amended June 2, 1974. Sulfur oxide regulation adopted Jan 3, 1975.

APPENDIX A

- State implementation plan information
- Current air quality information
- Current emission information

Tables in this appendix summarize original and modified state implementation plan information, including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. SAROAD data for SO_2 and TSP monitoring stations are shown for AQCR's in the state. NEDS emissions data by AQCR[1] are tabulated and broken down into fuel burning categories.

An emission tolerance, or emission tonnage which might be allowed in the AQCR and still not violate national secondary ambient air quality standards, is shown for particulates in Table A-9. The intent of this calculation is to indicate possible candidate regions for fuel switching. Tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from more recent data. The value of the emission tolerance provides an indication of the potential an AQCR possesses for fuel switching and regulation relaxation.

It is emphasized that emissions tolerance is a region-wide calculation. This tolerance obviously makes more sense in, say, an urban AQCR with many closely spaced emissions sources than in a largely rural AQCR with geographically dispersed emissions.

No regional tolerance for emissions was calculated for SO_2 in Wyoming. Low ambient SO_2 levels throughout the state make "rollup" calculations appear unrealistic.

---

[1] "1972 National Emissions Report," EPA 450/2-74-012, June 1974

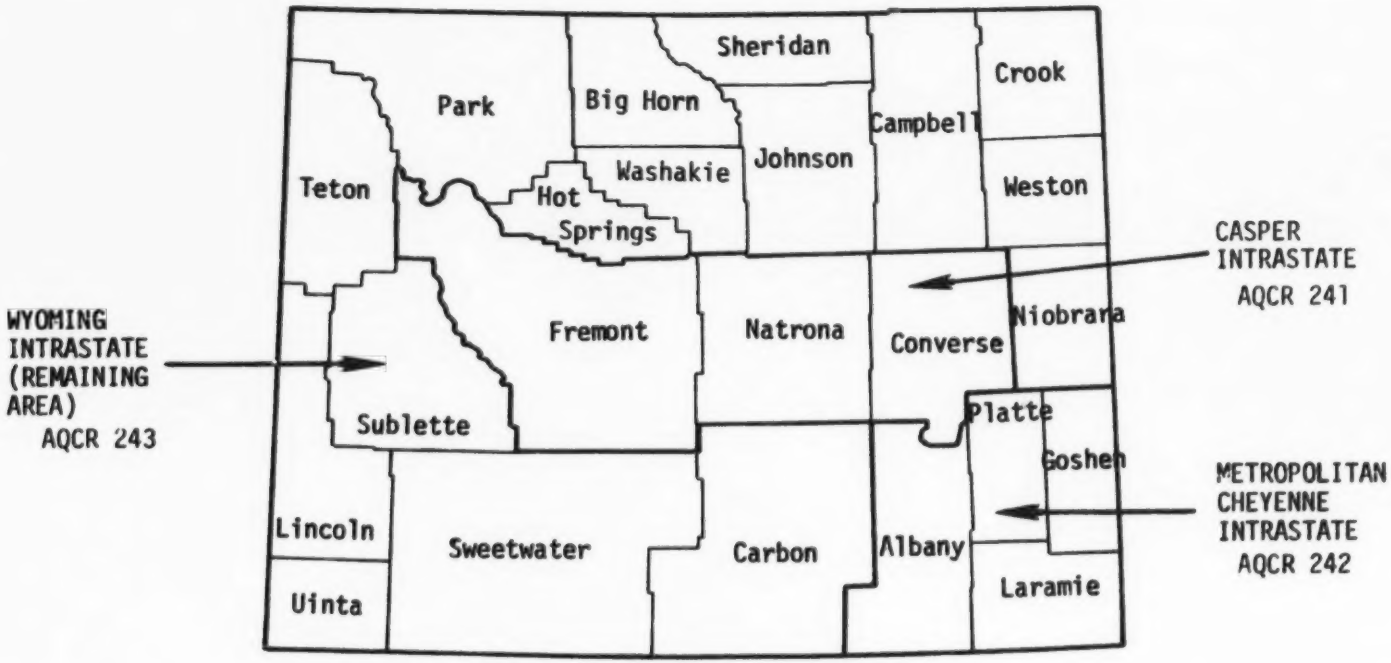

Figure A-1. Air Quality Control Regions in Wyoming

Table A-1. AQCR Priority Classification and AQMAs - Wyoming

AQCR	Fed. #	Part.[b]	SO_x[a]	NO_x[c]	Demographic Information			AQMA Designations[d]		
					Population 1970	Square Miles	Population Density	TSP Counties	SO_x Counties	NO_x Counties
Casper	241	II	III	III	85554	18819	4.5	(1)Converse	None	None
Cheyenne	242	II	III	III	100162	11265	8.9	None	None	None
Wyoming	243	III	III	III	147200	67122	2.2	(2)Campbell, Sweetwater	(1) Sweetwater	None

Criteria Based on Maximum Measured (or Estimated) Pollution Concentration in Area

Priority	I	II	III
	Greater than	From - To	Less than
[a]Sulfur oxide:			
Annual arithmetic mean ..	100	60-100	60
24-hour maximum	455	260-455	260
[b]Particulate matter:			
Annual geometric mean ...	95	60- 95	60
24-hour maximum	325	150-325	150
[c]Nitrogen dioxide	110		110

[d]Federal Register, August, 1974 SMSA's showing potential for NAAWS violations due to growth

Table A-2. Attainment Dates - Wyoming

AQCR #	AQCR Name	Particulates Attainment Dates		Sulfur Dioxide Attainment Dates		Nitrogen Oxides Attainment Dates
		Primary	Secondary	Primary	Secondary	
241	Casper	a	9/30/76	a	a	a
242	Cheyenne	a	1/31/74	a	a	a
243	Wyoming	a	5/15/76	a	a	a

[a]Air quality presently below standards

Table A-3. Ambient Air Quality Standards - Wyoming (Expressed as $\mu g/m^3$)

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide
		Annual	24-Hr.	Annual	24-Hr.	3-Hr.	
Federal[1] (Nov.1972)	Primary	75(G)	260[2]	80(A)	365[2]	--	100(A)
	Secondary	60(G)	150[2]	---	---	1300[2]	100(A)
State		60(G)	150[2]	60(A)	260[2]	1300[2]	100(A)

1. Federal regulations apply
   (G) Geometric Mean
   (A) Arithmetic Mean

[2]Not to be exceeded more than once per year

Table A-4. AQCR Air Quality Status (1973), TSP[a] - Wyoming

AQCR Name	AQCR #	# Stations Reporting	($\mu g/m^3$) TSP Concentration			# Stations Exceeding Ambient Air Quality Standards						% [c] Reduction Required to Meet Annual Secondary Standard	% [d] Reduction Required to Meet 2nd 24-Hr. Standard
			Highest Reading		2nd Highest Reading 24-Hr	Primary		Secondary					
			Annual	24-Hr.		Annual	24-Hr.[b]	Annual	%	24-Hr.[b]	%		
Casper	241	3	68	221	192	0	0	2	67	3	100	29	22
Cheyenne	242	4	74	196	155	0	0	1	25	1	25	41	3
Wyoming	243	6	118	321	277	1	1	1	17	2	33	74	46

ⓐ 1973 air quality data in the SAROAD data bank, June 7, 1974.

ⓑ Violation based on the 2nd highest recorded 24 hour concentration.

ⓒ [1]Formula % reduction = $\frac{\text{Annual Geometric Mean (AGM) - annual secondary STD}}{\text{AGM - Background}}$

[2]Wyoming background TSP assumed to be 40 ug/m[3]

ⓓ No background assumed for 24 hour levels.

Table A-5. Wyoming AQCR Air Quality Status (1973), SO_2[a]

AQCR Name	AQCR #	# Stations Reporting 24-Hr (Bubbler)	# Stations Reporting (Contin.)	SO_2 Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Stds. Primary Annual	Primary 24-Hr[b]	Secondary 3-Hr	% Reduction Required To Meet Standards
Casper	241	2	N/A	8	16	14	0	0	0	Presently Meets Standards
Cheyenne	242	1	N/A	6	22	11	0	0	0	Presently Meets Standards
Wyoming	243	2	N/A	7	12	10	0	0	0	Presently Meets Standards

[a]1973 air quality in National Air Data Bank as of June 7, 1974

[b]Violations based on more than one reading in excess of standards

Table A-6. Fuel Combustion Source Summary[a] - Wyoming

AQCR Name	AQCR #	Power Plants		Other Fuel Combustion Point Sources[b]	
		NEDS[a]	FPC[b]	Particulate	SO_2
Casper	241	1	1	4	3
Cheyenne	242	0	0	3	1
Wyoming	243	4	2	8	6

[a]All sources from National Emission Data Bank Listing as of December 6, 1974.

[b]Federal Power Commission information for 1973 of major power plants

Table A-7. Wyoming Emissions Summary, SO_2 (10^3 tons/yr), 1972

AQCR	Total (10^3 Tons/Year) (1972 data)	Percent Fuel Combustion	Electricity Generation		Point Source Fuel Combustion		Area Source Fuel Combustion	
			(10^3 Tons/Year)	% of Total Emission	(10^3 Tons/Year)	% of Total Emission	(10^3 Tons/Year)	% of Total Emission
Casper - 241	33.0	70.3	19.6	59.4	1.3	3.9	2.3	7.0
Cheyenne-242	13.7	20.4	0	0	1.1	8.0	1.7	12.4
Wyoming -243	29.8	83.8	20.1	67.4	1.8	6.0	3.1	10.4

Table A-8. Wyoming Emissions Summary, Particulates (10^3 tons/yr), 1972

AQCR	Total (10^3 Tons/Year) (1972 data)	Percent Fuel Combustion	Electricity Generation		Point Source Fuel Combustion		Area Source Fuel Combustion	
			(10^3 Tons/Year)	% of Total Emission	(10^3 Tons/Year)	% of Total Emission	(10^3 Tons/Year)	% of Total Emission
Casper - 241	21.9	88.3	18.6	84.9	0.23	1.1	0.50	2.3
Cheyenne-242	4.3	10.7	0	0	0.09	2.1	0.37	8.6
Wyoming -243	57.0	37.9	20.0	35.1	0.60	1.1	0.99	1.7

Table A-9. Wyoming Particulate Emission Tolerance

AQCR	Percent Reduction Required Based On 1973 AQ Data	NEDS Emissions (10^3 Tons)	Allowable Emissions (10^3 Tons)	Emission [2] Tolerance (10^3 Tons)
Casper (241)	29[1]	21.9	15.5	0
Cheyenne (242)	41[1]	4.3	2.5	0
Interstate (243)	74[1]	57.0	14.8	0

[1] Based on AGM with 40 ug/m^3 background.

[2] Current air quality data do not indicate particulate emission tolerance for Wyoming AQCRs.

Table A-10. Wyoming Fuel Combustion Regulations

PARTICULATES	SULFUR OXIDES	NITROGEN OXIDES
Existing Sources: Emissions In Lbs/10^6 Btu / Input Million Btu/hr 0.6 / 1 0.6 / 10 0.4 / 100 0.2S / 1000 0.2 / 10000	**Existing Sources:** (Before Jan 1, 1975) For coal use: Heat Input / lbs $SO_2/10^6$ Btu 250×10^6 / No limit 2500×10^6 / 1.2 5000×10^6 / 0.5 5000×10^6 / 0.3	Applies to new, existing or modified sources. 1) Gas-fired equipment: Shall be limited to 0.2 pounds per million Btu of heat input 2) Oil-fired equipment: Shall be 0.3 pounds per million Btu of heat input.
Industrial sources & power plants Shall be limited to 0.10 pounds per million Btu maximum 2 hr average	**Power Plants:** 1) 0.8 lbs/10^6 Btu (liquid fuels) 1.2 lbs/10^6 Btu (solid fuels) **Industrial Sources (After Jan 1, 1975)** Coal 0.2 lbs $SO_2/10^6$ Btu Oil 0.8 lbs/10^6 Btu	NSPS for **Power Plants** 1) 0.7 lbs/10^6 Btu (solid fuels)

1) Federal New Source Performance Standards (NSPS), 36 Fed. Reg. 24876, Dec 23, 1971

2) Adopted Jan 31, 1975

APPENDIX B

Tables B-1 and B-2 are the assessment of AQCR's which should be examined for the fuel switching impact on particulate and SO_2 emissions. They also provide an identification of those AQCR's which show little potential for fuel revision or regulation relaxation if ambient air standards are to be attained.

The criteria for candidates are (1) the severity and breadth of air quality violations, (2) expected attainment dates for NAAQS, (3) the fraction of total emissions resulting from fuel combustion, and (4) AQMA designations. It should be noted that an AQCR may not necessarily need relaxation of regulations in order to accomplish fuel switching. Further, a good candidate in Tables B-1 and B-2 may show little potential for fuel switching after individual sources are examined. Finally, it is possible that an AQCR may have air quality levels below standard at present and may require more strict regulations than currently exist if all fuel burning sources were converted to dirtier fuels, i.e., "average" emission rate now may be below "average" regulations.

Table B-1. Candidacy Assessment for Relaxation of Particulate Regulations - Wyoming

AQCR	Air Quality # Monitors	Air Quality # Violations[1] Primary	Air Quality # Violations[1] Secondary	Expected Attainment Date	Any Counties AQMA Designations?	% Emissions from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
Casper 241	3	0	3	9/30/76	1	88.3	0	Poor
Cheyenne 242	4	0	1	1/31/74	0	10.7	0	Poor
Wyoming 243	6	1	2	5/15/76	2	37.9	0	Poor

[1] # Monitors exceeding either annual or 24 hour NAAQS for particulates.

Table B-2. Candidacy Assessment for Relaxation of SO_2 Regulations - Wyoming

AQCR	Air Quality # Monitors	Air Quality # Violations	Expected Attainment Date	Any Counties AQMA Designations?	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
Casper 241	2	0	(a)	0	70.3	b	Good
Cheyenne 242	1	0	(a)	0	13.7	b	Good
Wyoming 243	2	0	(a)	1	29.8	b	Poor[c]

[a] Air quality presently meet standards

[b] Present air quality is less than one-half the standard. Emission tolerances were not calculated in this case because it was felt that the results would be misleading. However, additional SO_2 emissions could be tolerated in all Wyoming AQCR's.

[c] This "Poor" rating is based on the fact that this AQCR contains a Designated AQMA.

APPENDIX C

This section is a review of individual power plants by AQCR. The intent is to illustrate fuel switching possibilities and particulate and SO_2 emissions resulting from these switches on an individual plant basis.

Current power plant information used to prepare Table C-1 was obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) NEDS emissions data.[1] For those plants listed by the FPC (1 above), the 1973 fuel schedule was assumed, otherwise, fuel use is for 1972. Heat inputs are those based on actual fuel values where known, and average values shown in footnotes of Table C-1 were used otherwise. SO_2 and particulates emissions are those associated with the fuel use listed. In the case of particulates, emissions were calculated using NEDS emissions factors applied to the listed fuel schedule (in both tonnage and $lbs/10^6$ Btu). When a plant was not listed in NEDS, AP-42 emission factors were used to estimate SO_2 and TSP emissions (Table C-3).

[1] National Emissions Data System Information, retrieved December 1974.

Table C-1. Wyoming Power Plant Fuel Combustion and Emission Summary[1]

County & AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual[2] Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
Lincoln AQCR 243	Naughton[3] 707MW	Coal, 0.5%S 5.0% Ash	2327	4280	22,600	1.20	9400	0.5	21,700	1.16	4100	0.22
Converse AQCR 241	Johnston[3] 758MW	Coal, 0.6%S 9.3%A	2897	4880	33,000	1.54	13,700	0.5	20,000	0.93	4700	0.22
Campbell AQCR 243	Niel Simpson[3] 28MW	Coal, 0.4%S 5.0% Ash	198	360	1390	0.9	1850	1.2	14.60	0.9	490	0.3
Sweetwater AQCR 243	Trona[3] 16MW	Oil (1% S)[4]	94	62	310	1.12	No Regulation		16	.06		
		Gas	2500	285					20	.02		
				347	310	0.2			36	.03	360	0.3
Weston AQCR 243	Osage[3] 35MW	Coal 0.4%S 5.2% Ash	219	400	1590	0.90	2100	1.2	673	0.4	500	0.3

1 Power plants having 10MW or greater generating capacity.
2 Coal 10^3 tons, Oil 10^3 BBLS, Gas 10^6 ft^3,

Table C-2. Power Plant Projected Development

AQCR	Owner	Plant	MW	Estimated Emissions NSPS - Tons/Yr		
				Particulates	SO_2	NO_x
Wyoming (243) Cambell Co.	Black Hills Power & Light	Wyodak #1[a] (1977)	330	1168	14032	8184
Wyoming (243) Sweetwater Co.	Pacific Power & Light	Jim Bridger #1[a] (1974)	508	1798	21600	12598
		Jim Bridger #2[a] (1975)	508	1798	21600	12598
		Jim Bridger #3[a] (1976)	508	1798	21600	12598
Wyoming (243) Sweetwater County		Naughton #4	860	N/A	N/A	N/A
		#5				
Platte County		Basin Electric 1, 2, 3	1500	N/A	N/A	N/A

Table C-3. AP-42 Power Generation Emission Factors

Fuel	Particulates Lbs/Ton	Particulates Lbs/10^6 Btu	SO_2 Lbs/Ton	SO_2 Lbs/10^6 Btu	Hydrocarbons Lbs/Ton	Hydrocarbons Lbs/10^6 Btu	NO_x (as NO_2) Lbs/Ton	NO_x (as NO_2) Lbs/10^6
Coal(1) (Bit.)								
General	160	7.4			0.3	0.013	18	0.78
Wetbottom 10% A	130	7.0					30	1.3
Cyclone	20	0.9					55	2.4
1% S	Same	Same	38	1.65	0.3	0.013	Same	Same
2% S	as	as	76	3.3			as	as
3% S	Above	Above	114	5.0			Above	Above
Oil(2)	Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal	
0.5% S	8	0.058	79	0.56	2	.014	105	0.75
1.0% S	8	.058	157	1.12	2	.014	105	0.75
2.0% S	8	.058	314	2.24	2	.014	105	0.75
Gas(3)	Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3	
(.3 lbs S/10^6 Ft^3)	15	.015	0.57	.00057	1	.001	600	0.60

(1) Coal 23 x 10^6 Btu/Ton
(2) Oil 140 x 10^3 Btu/Gal
(3) Gas 1000 Btu/Ft^3

APPENDIX D

The Table D-1 in this Appendix lists individual industrial/commercial/institutional sources of particulates and SO_2 emissions which might show fuel switching potential. The NEDS data available for this report is incomplete, and no attempt is made to comprehensively list Wyoming industrial sources.

Table D-1. Wyoming Industrial-Commercial Fuel Combustion & Emissions Summary

County	Plant Name Size, and Fuel Design	Fuel Use			Emissions			
					SO_2		TSP	
		Type % Sulfur % Ash	Annual[1] Quantity	Heat Input (10^6Btu/Hr)	Existing Tons/Yr Lbs/10^6Btu	Allowable Emissions (Based on Regulations Limits) Tons/Yr Lbs/10^6Btu	Existing Tons/Yr Lbs/10^6Btu	Allowable Emissions (Based on Regulations Limits) Tons/Yr Lbs/10^6Btu
Natrona AQCR 241	Little American Oil	Gas	425	49	1	No. Reg.[2]	4	128 0.6
Carbon	Petronics	Oil 0.3%	7.2	4.8	6	No. Reg.	2	13 0.6
Weston	Tesoro Petroleum	Oil 0.5%	9.5	6.3	13	No. Reg.	33	16 0.6
		Gas	-46	51	1	No. Reg.	38	

Reproduced from best available copy.

1 *{Oil - 10^3 bbls / Gas - 10^6 ft^3

2 See Table A-10, SO_2 regulations for oil and gas users apply only to new sources (after January 1, 1974)

APPENDIX E

A summary of Wyoming fuel use totalized from the NEDS data bank is presented in Table E-1. Table E-2 lists fuel production and consumption figures for Wyoming (1972).

Table E-1. Wyoming Stationary Source Fuel Summary

Point Sources	Coal (10^3 tons)	Oil (10^3 bbls)	Gas (10^6 ft^3)	Wood (tons)
Electric Generation	4114	10	43	
Industrial	4	1210	29574	
Commercial/Institutional	-	-	119	
Area Sources				
Resources	34	103	17500	10100
Industrial	-	1390	27360	
Commercial/Institutional	-	386	18350	
State Total	4219	3070	93212	10,100
(10^2 BTU)	83	18.1	93	0.1
Percent of Total Energy Supplied	(43%)	(9%)	(48%)	-

Table E-2. Energy Statistics for Wyoming

	Production	Consumption
Coal (10^3 Tons)	10928	4802
Oil (10^3 BBL)	140,011	17,491
Gas (10^6 FT^3)	375,059	121,226
Uranium [10^3 lbs U_3O_8]	8,544	--

*All oil and gas values are from "Fuel and Energy Data: U.S. by States and Regions," 1972 (U.S. Bureau of Mines). Coal consumption figure obtained from "Assessment of Impact of Air Quality Requirements on Coal in 1975, 1977, and 1980," (U. S. Bureau of Mines).